LEPTOLEGNIA FROM NORTH CAROLINA

(With Plate 16, Containing Five Figures)

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Leptolegnia caudata De Bary, the only known species of the genus, was found twice by De Bary from mountain lakes in Germany in 1881 and 1884, and has not certainly been seen since. In Rabenhorst's Kryptogamen Flora (1^4: 346) Dr. Fischer refers to a sterile plant that he thought might be this species, and Dr. Roland Thaxter writes me that he has seen a form without sexual reproduction that resembled *Leptolegnia.*

The genus was defined by De Bary as follows:* "Eine Oospore, das ganze Oogon lückenlos erfüllen; sonst wie *Saprolegnia";* and the species was described in some detail a little later.†

At Chapel Hill, North Carolina, in the fall of 1908 I found in a culture jar of algae, that had been brought into the laboratory from pools in the vicinity, a species of water mold that proved to belong to this genus. It has now been cultivated for almost a year and carefully studied in all stages.

At the last meeting of the North Carolina Academy of Science in May of this year (Reported in Science 30: 188. Aug. 6, 1909) I referred our plant to a new species, and I still think that from some points of view it might be so considered. But further cultivation in different media shows so great a variability that I have decided to take the conservative course and refer the North Carolina plant to *L. caudata.*

In my observations certain facts have been established that add to or are at variance with De Bary's description, and it may be well to record them.

My observations on the sporangia agree with De Bary's except that in old cultures the sporangia may become very complex from

* Botanische Zeitung 46: 609. 1888.

† Botanische Zeitung 46: 631. 1888.

the extension of a single sporangium into a number of adjoining branches. In Fig. 1 is shown such a sporangium that was observed before and during the discharge. All the spores emerged from the tip of one of the branches (at *a* in the figure) and the spores at the tips of the other branches had to travel all the way down these and out at *a*.

De Bary does not mention the shape or behavior of the spores, but I found them to exhibit some remarkable peculiarities. In nearly all cases they emerge from the sporangium much drawn out, as long, more or less cylindrical rods, with the two cilia attached to the center on one side. As soon as they escape, the two ends of the rod begin to fold backward, away from the cilia, and fuse as they go, until by complete fusion they lose their identity and form a pear-shaped spore with the cilia near the tip, and the long axis at right angles to the original rod. By killing the spores during emergence they were caught in all stages of this transformation and drawn to illustrate the process, as shown in Fig. 5; in which *a* shows several spores that were killed in the sporangium. They become more elongated as they pass out and on emergence have the shape shown in *b* or *c*.

The dimensions of the oögonia were not given by De Bary, but I find them to be 30μ or 40μ in diameter, and essentially spherical except where modified by slight protuberances to meet the antheridia. Judging from the figures, the oögonial branches as seen by De Bary were shorter than I found them to be, but in other respects not different. Two, three, or even more antheridia to the oögonium were common in my material. In one case I counted five. More than two are not mentioned by De Bary. The antheridial branches are generally borne as rather short offshoots from a slender main branch that shows a marked tendency to twine about the larger female branches (Figs. 2 and 3), but they may terminate a long branch. They are always of diclinous origin.

The transference of material from antheridium to oöspore was left in doubt by De Bary, and I have not seen the actual passage of such material. The evidence however is convincing that fertilization does take place. The antheridium is full of protoplasm when it is cut off, and is empty a little later; and the amount of

protoplasm contained in it is so large as to make its disappearance practically impossible in any other way except by discharge. Moreover, when the empty antheridium is pulled from the oögonium a distinct circular opening can be seen in it and the opening in the original membrane on the oögonium can be easily made out (Fig. 4).

The oögonia are very rarely found, and this accounts for my failure to see the fertilization process. I had cultivated the plant for about three months before the first oögonia appeared, and they were matured during the Christmas recess. They have been produced only two or three times since, and that only sparingly, notwithstanding my efforts to induce sexual reproduction by cultures on various insects and in different chemical solutions. The results of some of these experiments are as follows:*

1. On gnat in .05 per cent. haemoglobin solution in shallow dish. Growth was about as extensive as in water but there was a much more profuse branching, especially near the ends of the hyphae. The difference was easily visible to the naked eye. No sexual reproduction.

2. On gnat in a solution of ½ haemoglobin (.05 per cent.) and ½$Ca(NO_3)_2$(.2 per cent. sol.). About twenty oöspores, all with antheridia.

3. Cultures made on gnats in shallow petri dishes gave no oöspores in any of the following solutions (haemoglobin in .05 per cent. sol. and chemicals in .2 per cent. solution in all cases):

Haemoglobin + KNO_3
Haemoglobin + $K_6H_3(PO_4)_2$
Aqueous sol. of $Ca(NO_3)_2$
Aqueous sol. of KNO_3
Aqueous sol. of $K_6H_3(PO_4)_2$

Cultures on gnats, flies, wasps, mosquitoes and spiders showed no noticeable differences. Cultures under several inches of water were unfavorable for the formation of either sexual or asexual reproductive organs.

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* The methods of Kauffman were followed in the main. See Annals of Botany **22**: 361. 1908.